

**Early onset Jaundice in the newborn:
Understanding the ongoing care of mother and baby within the
neonatal unit**

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ABSTRACT

Neonatal hyperbilirubinaemia or jaundice is a relatively common condition within the early life of a newborn baby presenting from normal physiological changes to erythrocyte metabolism after day three of life. Less common is early onset Jaundice arising on day one from a pathological process. This paper presents a case study of a baby presenting with this condition due to ABO blood group incompatibility who was admitted from the postnatal ward to the neonatal unit (NNU). The focus will be the period after initial interventions on admission to the NNU and the ongoing care issues thereafter. Both clinical and psycho-emotional care issues are raised for the baby and family from which the midwife can learn about the experiences undergone while care is taken over, be it temporarily, by the neonatal unit staff. It is important that midwives understand what care is delivered during the neonatal unit stay so that they can empathise and assist with family coping strategies following the separation of baby from the parents at a time of often emotionally charged transition to parenthood.

KEY WORDS

Early onset newborn Jaundice Neonatal unit admission
Assessment and treatment of jaundice Family centred care
Psycho-emotional impact Maternal experience

Key Phrases

- Early onset jaundice requires admission to the neonatal unit from the postnatal environment for further investigation and management.
- Literature supporting the different methods of assessing, diagnosing and treating Jaundice is examined in the context of evidence based care.
- The admission to a neonatal unit and the resulting separation of the newborn baby from the family along with the anxiety this can cause in the immediate postnatal period is well documented.
- Midwives should be aware of the care issues and interventions delivered to newborns during their temporary stay on the neonatal unit so that they have the necessary and optimal information to support parents appropriately.
- Many important issues can be captured and discussed arising from a case study approach to learning

INTRODUCTION

This paper presents a case study discussion of a baby that presented with early onset Jaundice and the related care issues that ensued on admission to the neonatal unit (NNU). The paper will discuss two main areas; the assessment and delivery of evidence based care of jaundice and it's treatment and the psycho-emotional needs of the family as related to this case. Considering both aspects puts the discussion within a holistic framework. The areas discussed are of relevance to any midwife caring for babies and their families within the postnatal period. Identification of clinical conditions can mean the subsequent transfer to the NNU from the postnatal setting where care is temporarily taken over by the neonatal team. Midwives however should be aware and understand the care babies receive in order to support the family optimally. It also raises awareness of the maternal experiences witnessed when their otherwise healthy baby is admitted to the neonatal unit.

Jaundice is the term used to describe excessive circulating bilirubin (hyperbilirubinaemia) formed as a result of the breakdown of haemoglobin which causes the yellow discolouration of the skin and sclera (Cohen, 2006). As one of the most common conditions requiring medical attention in neonates, it is widely prevalent as a global health problem (Shortland et al, 2008). Timely identification and treatment of high circulating unconjugated bilirubin is essential to prevent Kernicterus, a pathological diagnosis characterised by bilirubin staining of the brainstem nuclei

(Maisels and Watchko, 2003). An estimated 80% of preterm and 60% of term neonates become jaundiced in the first 7 days (National Institute for Health and Clinical Excellence (NICE), 2010). Jaundice can be either physiological or pathological and the differences can be seen in Figure 1.

Figure 1
Types of neonatal Jaundice

JAUNDICE TYPE	Onset / timing	Type of bilirubin	Causes
Physiological	After day 3 to day 7 approximately	Unconjugated	Normal physiological haemolysis of fetal erythrocytes (red blood cells). Heme breaks down to form unconjugated bilirubin. Hepatic immaturity, high red cell load at birth and short life span of red blood cells increase the tendency to develop this type of jaundice
Pathological	Within the first 24 hours	Unconjugated	Due to a disease process such as ABO haemolytic disease, Rhesus incompatibility, severe / congenital infection
Prolonged	Persist past the usual 7-10 days period	Conjugated or unconjugated	Exclusive breast-feeding although no intervention is necessary. Infection Hypothyroidism, Haemolytic diseases such as G6PD deficiency or Spherocytosis Hepatic disease or biliary conditions. Total parenteral nutrition

Midwives should be mindful and vigilant for the signs and onset of jaundice particularly over the first ten days of life.

CASE STUDY

In the following case study, all names in the text have been changed to protect confidentiality (Nursing and Midwifery Council (NMC), 2008). Male infant Tom, a term baby born at 39 weeks gestation weighing 3.6kg was admitted to a level 2 neonatal unit from the postnatal ward at one hour of age with ABO blood group incompatibility. This term is used to describe an antibody reaction that occurs when the maternal blood group is O, and the baby's blood group is A or B. Antibodies present in the mothers circulation can cross the placenta and attach to sites on fetal red blood cell; resulting in haemolysis and increased risk of jaundice (NICE, 2010). Diagnosis can be made from a direct antibody test (DAT), a blood test taken to detect the presence of abnormal antibodies that are produced following this incompatibility of mixed blood. DAT-positive, ABO heterospecificity is associated with increased haemolysis and a high incidence of neonatal hyperbilirubinemia (Kaplan et al, 2010). Tom presented with visible jaundice on day one of life with a measured serum bilirubin (SBR) that was over the treatment threshold for phototherapy. Although jaundice was clearly visible, visual assessment should always be confirmed by other means (Mishra et al, 2009); in Tom's case, *early onset* jaundice on day one due to a pathological process necessitated serum bilirubin measurements (SBR) rather than transcutaneous (TcB) (NICE, 2010; 2012).

Following admission to the NNU, Tom was placed immediately under phototherapy lights. Phototherapy, if used appropriately at a recommended distance and with maximum skin exposure to achieve optimal irradiance, is capable of controlling bilirubin levels in most neonates (Maisels and Watchko, 2003). Single phototherapy is usually commenced first but multiple phototherapy using more than one light source is recommended when bilirubin levels do not decrease and / or continue to rise rapidly (Silva et al, 2009; NICE 2010; 2012).

In Tom's case, irradiance was maximised by using 4 different lights due to him having early onset jaundice on day one with a rapidly increasing SBR. However, evidence suggests that using multiple lights probably has no advantage over just using two light sources (Naderi et al, 2009; NICE, 2012). Certainly, this was so with Tom as his levels continued to rise with four lights. Therefore he was deemed suitable for an exchange transfusion. When the unconjugated bilirubin remains above the threshold for treatment despite multiple phototherapy, a double volume exchange transfusion is performed where twice the neonate's blood volume is removed in small portions replaced slowly with fresh blood (Thayyil and Milligan, 2006). Evidence suggests that Immunoglobulin infusion can also be effective for ABO haemolytic disease prior to an exchange transfusion (Alcock and Liley, 2002). To date however, this has not been recommended as routine practice although a recent randomised controlled trial by Shahian and Moslehi (2010) and the current evidence update from NICE (2012) suggests that this *may* be a potential recommendation in the future.



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At 72hours, Tom had completed the exchange transfusion and his condition was stabilising. The discussion continues now *from* the age of 72 hours during the stay in the neonatal unit.

Although his condition had improved, he continued to be treated with two phototherapy lights as his SBR remained over the threshold for phototherapy but below the treatment line for exchange transfusion. He was nursed in an incubator fully exposed with only a small nappy in place and a mask covering his eyes, the phototherapy was provided by a conventional overhead lamp and a fibreoptic 'Biliblanket®' comprising a pad placed against the baby's back. This enabled the recommended 'blue' light component of the whole spectrum to be given, documented as the most effective in reducing SBR regardless of type of light source.

In a study comparing different sources of light no significant differences were found in SBR reduction between florescent tubes or light emitting diodes (LED) (Kumar et al, 2010).

After receiving handover it was noted that Tom appeared in distress; he was on minimal enteral feeds as he had not been tolerating them well necessitating a nasogastric tube (NGT) to be passed and administration intravenous (IV) fluids. Therefore he showed signs of restlessness and inconsolability possibly due to a combination of being hungry, the presence of an IV cannula and NGT and / or from the effects of being exposed under phototherapy lights. He was also being woken three hourly for heel pricks to monitor his SBR due to the high levels noted previously. It was apparent that Tom's mother was also very upset and stressed as she had had very little opportunity to hold Tom due to exchange transfusion and continuing need for uninterrupted phototherapy. She was very open about her experiences, expressing distress at her baby's appearance, helplessness in not being able to comfort him and difficulty in expressing her milk. Milk expression was important to her as she wanted Tom to receive her own milk until such time she could breast feed. The effects of separation from her baby due to admission to the NNU must also be considered here. In addition, Tom's mum was discharged home on day 2 increasing the impact of maternal-baby separation. Evidence has shown the negative effects of early separation in relation to the barrier to contact and bonding straight after birth (Bystrova et al, 2009; POPPY Steering group, 2010). This will be addressed in more detail later in this paper.



Image source: J Petty

Although Tom's physiological requirements had been attended to and he appeared in a much more stable condition, it was also clear that maternal stress was high. Discussions did then follow to decide whether there was still the need for uninterrupted phototherapy and the multi-disciplinary team agreed that normalising Tom's care as much as possible would be beneficial to both mother and baby. This was to facilitate close proximity, interaction and bonding between them, vitally important in the early days of a baby's life (BLISS, 2009; Beck et al, 2009). It was proposed that short periods off phototherapy for breast feeds and skin to skin care was appropriate at this stage as well as the commencement of additional support to the mother with expressing her breast milk to use until oral feeding was established.

These strategies were implemented along with increasing enteral feeds gradually as tolerated, reduction in the frequency of heel pricks to 6 hourly and reducing phototherapy to a single source as the SBR continued to decrease. The aim here was to continue phototherapy until the recommended threshold for cessation of treatment was reached (50 micromols / litre below the phototherapy threshold (Barak et al, 2009; NICE 2010, 2012). Before the discussion further explores the issue of mother-baby separation, we now turn to clinical assessment.

ASSESSMENT OF JAUNDICE

Assessment forms the basis for the delivery of care. Effective assessment of Tom's situation and care was made at the start of the shift including baseline assessment of appearance and SBR level using the treatment threshold graph and a recent history. NICE (2010) guidelines contain a series of flow charts to aid the assessment of individual neonates and to guide through to evaluation and reassessment.

Three main methods exist for the assessment and identification of Jaundice – Clinical observation, serum bilirubin (SBR) and transcutaneous monitoring (TcB). (Figure 2)

Figure 2
Methods of assessing for the presence of jaundice

Clinical observation	Transcutaneous (TcB)(skin)	Serum Bilirbin (SBR)
<p>View the baby naked in good, natural light. Observe the sclera, oral mucosa and blanched skin for the presence of yellow discolouration (Ford, 2010)</p> <p>This method however should not be relied on solely (Mishra et al, 2009)</p>	<p>Sternum (and sometimes the forehead) application of non-invasive transcutaneous probe for near term babies <i>after</i> the first 24 hours.</p> <p>Readings above 250 micromols / L are unreliable however and this should not be used for babies under 35 weeks gestation</p>	<p>For babies less than 24 hours old, where visible jaundice is present and for any baby less than 35 weeks gestation.</p> <p>For any suspected jaundice in the first 24 hours, and SBR should be done within 2 hours. More invasive as requires heel lancing for blood sampling.</p>

Various studies have explored the use of transcutaneous bilirubinometers (TcB). Briscoe et al (2002) examined their use in term babies through an observational study which concluded that the equipment can determine if there is a need for blood sampling but cannot be used to identify SBR values accurately. Hartshorn and Buckmaster (2010) more recently conducted a 'before and after study' which consisted of implementing a protocol for using TcB and found that heel lancing procedures could be significantly reduced by following such a means of assessment. Both these studies, amongst others, acknowledge that TcB has its limitations but can be effective in the assessment of jaundice for particular babies detailed in Figure 2.

It is also recommended as a way of confirming suspected jaundice assessed by visual inspection (Mishra et al, 2009). The use of TcB was not suitable for assessment of Tom when his SBR was so high within the first three days of life. However he may have benefitted greatly from it after his SBR started and continued to drop and stabilise. Unfortunately transcutaneous monitors are not always available and therefore heel lancing has to be relied upon as the means of access for measuring SBR; this was so with Tom leading to a hindering of his well being and comfort.

Assessing comfort levels is important within the care of a baby with jaundice as highlighted by this case. Morrow et al (2010) explored methods of pain reduction during heel lancing in a randomised controlled trial of 42 infants and measured the difference in pain scores for babies who were held and swaddled while undergoing routine heel lance procedures compared to those who were lying on their backs and not swaddled. They concluded that swaddling and positioning significantly reduced pain scores for the neonate. Other evidence has explored means of reducing procedural pain such as the use of sucrose (Stevens et al, 2010; Meek, 2012), breast-milk, (Shah et al, 2007) and containment (Cignacco et al, 2012) to minimise pain and discomfort. These relatively simple and straightforward strategies can assist to promote comfort in babies such as Tom and can often be overlooked when carrying out routine procedures such as heel lances (Robins, 2007). Overall, a key message here is that assessment of a baby's comfort levels must always be carried out to minimize any undue stress so that it can be managed appropriately.

TREATMENT AND CARE OF JAUNDICE

Safety of the neonate is always of utmost importance, including the choice of treatment and equipment. Simply, the aim of phototherapy is to convert unconjugated bilirubin to a conjugated, excretable form. Methods of administering phototherapy are summarised very comprehensively by Wentworth (2005):

- **Conventional;** These devices typically use one or more halogen bulbs or tubes, fluorescent lamps, or most recently, light emitting diodes (LEDs). The light source is positioned above or below the baby and the irradiance is dependent on the distance between the baby and the lights. Obviously the closer the lights can be positioned to the neonate the higher the irradiance, but care must be taken to prevent overheating the neonate while ensuring that as much skin as possible is exposed. The manufacturer usually specifies a minimum distance at which a device should be used and this can vary from 25cm to 50cm.
- **Fibreoptic;** A standard light source, usually a quartz halogen bulb is passed through a filter before being channelled down a fibreoptic bundle into a pad of woven optic fibres. The pad can then be placed next to the baby's skin. Several fibreoptic devices are available worldwide, but the Ohmeda BiliBlanket® is perhaps most commonly known in the UK. The Bilibed® (mattress) from Medela AG is also available.

- **Combined** Since the success of phototherapy depends on the light spectrum used (e.g. blue light at 450 nm) along with the surface area of skin exposed to light and the irradiance (intensity), a combination of devices can be used at once to maximise effectiveness.

A systematic review conducted by Mills & Tudehope (2001) of 24 randomised controlled trials to evaluate the effectiveness of fibreoptic phototherapy, concluded that fibreoptic devices when used alone are less effective at lowering SBR in term neonates than conventional phototherapy or a combination of both. The exception is in preterm neonates where both are equally effective. However, fibreoptic phototherapy can be a more practical option in view of ease of access to the neonate and it does lower SBR; just at a slower rate. In the case of Tom, the appropriate choice of equipment had been chosen; a combination of both types of phototherapy used simultaneously, deemed necessary given the continuing high SBR following the exchange transfusion.

Wentworth (2005) compared the phototherapy devices available and stated that fibreoptic phototherapy such as the 'Bilibed®' allows for easier care procedures such as breast feeding and cuddling. This highlights that once the SBR had come down enough, such methods were ideally suited to Tom to continue his phototherapy whilst allowing the mother to feed him promoting close proximity and contact.

As well as interventions to treat high bilirubin, it is essential to consider the care, safety and risk in relation to the use of phototherapy. Covering the neonates' eye's, maximising the irradiation area by sound skin exposure, avoiding skin creams and monitoring temperature closely are widely acknowledged care issues.



IMAGE SOURCE: http://commons.wikimedia.org/wiki/File:Jaundice_phototherapy.jpg [Martybugs](#)

One topic which is not always considered as readily is the significance of post-phototherapy SBR rebound which is explored by Kaplan et al (2006). A prospective clinical survey of 226 infants concluded that bilirubin can rebound to significantly high levels in the 24hours following discontinuation of phototherapy. This study highlights the need for follow-up post-phototherapy SBR levels to be obtained to ensure possible rebound is monitored, also recommended by NICE (2010). Tom's continued phototherapy despite the SBR being below treatment line was due to concerns that if the phototherapy stopped it may rebound rapidly back to a clinically significant level.

Historically, many units have adhered to having two results below the treatment line on single lights as a criterion to stop phototherapy. Nowadays, NICE (2010) guidelines state that if the SBR is stable and 50micromol/litre below the threshold for phototherapy, it can be stopped with a check SBR advised after 12-18 hours to ensure no rebound effect has occurred. . This has been confirmed in a study comparing a high (50 micromols/L) and low (17 micromols / L) threshold level which found the former led to a shorter duration of phototherapy and hospital stay (Barak et al, 2009). This was a deciding factor in stopping the phototherapy for Tom when he was five days old.

FAMILY CENTRED CARE

Throughout the discussion so far, the effect of NNU admission and treatment for jaundice has become apparent and so we now turn to this case in the light of family centred care. This concept is based upon the theory of promoting reciprocal relationships that encourage parental involvement in care (Beck et al, 2009).The Platt report (1959) is one of the most influential and widely recognised reports regarding families in hospital and caused a movement towards the approach of family centred care. Abundant studies have been conducted to explore the impact of admission to a neonatal unit on families and have concluded consistently that there can be a significant negative impact on them along with the need for optimum family centred care (Nyström et al, 2002; Fenwick et al, 2001; Wigert et al, 2006). Other work has explored the effects of separation between mothers and babies.

Cleveland (2008) performed a literature review on the topic of parents in the NNU and found that early contact with baby was identified as a major need of parents following their baby's admission. Heermann et al (2005) also performed a literature review exploring the impact of admission to NNU on the mother and family concluding that the practice of working in partnership with parents and supporting developmental care for both the mother and her baby is an essential part of early care highlighting the need for empathetic, prioritised family centred care.

A study by the POPPY Steering group (2010) also found that separation immediately after birth was very stressful to parents and the status of mothers was often overlooked or not acknowledged. The immediate effects of separation on the baby have also been studied; Ferber and Makhoul (2004) found in a sample of 47 mother-infant pairs at term that immediate skin to skin contact positively influenced the state organisation and motor regulation of the baby shortly after delivery compared to no contact at birth. Bergman et al (2004) found similar results in low birth weight babies. A prospective randomised controlled trial of 34 babies found better cardiovascular stability from early skin to skin contact compared to those nursed within a closed incubator. They conclude that such instability seen in the latter group when separated in the first six hours of life is consistent with the mammalian distress responses and that babies should not be separated from their mothers. Clearly however, there are cases when separation due to illness and hospitalisation cannot be avoided but nonetheless such evidence emphasises the potential effects on the baby.

Feldman (2004) concurs with such findings stating that close contact at birth has a positive effect on the baby across infancy. Bystrova et al (2009) studied 176 mother-infant pairs and found that skin to skin, early suckling or both positively influenced mother – baby interaction one year later compared to pairs that were separated within the first day of life due to hospitalisation. Veijola et al (2004) explored the long term effects of parental separation at birth on adult psychological outcome in a cohort study of 3020 subjects and found an increased risk of hospital treated depression in those individuals who had been separated from their parents in the early weeks of life due to tuberculosis.

With any longitudinal study, one must always consider the potential confounding influences on measured outcomes. However, such evidence as discussed above does consistently conclude that separation of baby from mother at birth should be avoided if at all possible. Brethauer and Carey (2010) explored the impact of having a neonate with jaundice requiring phototherapy. Although it is recognised as a small, descriptive study, it allows insight into thoughts and feelings of the lived experiences of the individual mothers involved. A number of major themes emerged including mothers feeling a loss of control, distress from infants' appearance, exhaustion and feeling robbed; also highlighted were feelings of being defensive or at fault. This study highlights and mirrors some of the feelings observed in the case of Tom.

Some of the implications highlighted by Brethauer and Carey (2010) include the need for health professionals to bridge the gap and meet the needs of mothers. The study stressed that often the requirements of mothers are 'rarely met'. It is acknowledged that this was a small study limiting the generalisability; however, the results are in agreement with the POPPY findings and imply that in some cases the needs of the family are overlooked or not given the priority and time needed.



Other aspects of the impact of having a baby admitted in hospital are also important to recognise. A Cochrane review of 34 different trials; encompassing more than 29,000 mothers and their babies, investigated and analysed the effect of breast feeding support for mothers (Britton et al, 2009). The review found that all forms of lactation support were beneficial in increasing duration of breast feeding or expressing; highlighting the importance of any intervention in aiding mothers to breast feed to meet the goals of the World Health Organization (2009) to exclusively breast feed. Support for breast feeding is essential within a stressful clinical setting.

Latto (2004) also acknowledges and discusses the potential negative impact of environment, particularly a busy neonatal unit, on a mothers' ability to breast feed or express their milk. In addition, expressing milk can aid feelings of attachment when a neonate is hospitalised or separated from the mother but support with this is imperative.



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In the case of Tom; the mother tried without seemingly succeeding at first in being able to express her breast milk effectively. This was one of the factors that had a negative influence on the mother and therefore her ability to form an attachment. Tom's mother needed additional support to breast feed to meet the needs of her baby and herself. Through help and advice given, the mother she was able to optimise her milk supply, feel satisfied and ultimately feel important. This is certainly a more optimal basis for forming a positive attachment.

Throughout the care provided for any baby, developmental care plays a crucial role, which is providing care that is conducive to well-being and comfort in a safe environment. Developmental care is described by Lissauer and Fanaroff (2006) as tailoring care to improve potential by optimising the social and physical environment. The experience of fathers or siblings has not been specifically addressed in this case but their needs are just as important within the concepts of both family centred and developmentally supportive care.



Image source: J Petty

PRACTICE RECOMMENDATIONS

Overall, analysing the care for Tom has raised some important practice points. Certainly after discovering the mother's initial negative feelings, subsequent care was improved by adapting interventions and approaches to meet both the baby's clinical needs and by involving the mother more proactively.

Ensuring that holistic and developmental aspects of care were considered also ensured that positive outcomes were more likely to be achieved; for example, successful breast-feeding and bonding. The following practice points should be emphasised for any health professional caring for mother and baby in this type of care:

- Ongoing and consistent support for breastfeeding mothers regardless of the baby's condition
- A unified and evidence based approach to assessment and treatment of jaundice.
- Parents should be considered in the care and decision making of their baby, their needs must be recognised and strategies employed to minimise the negative effects of an admission to the neonatal unit. A recent review by Lanlehin (2012) identifies the many factors associated with information satisfaction in parents within the neonatal unit recognising the vital need for involvement in decision making and appropriate information giving.
- The need for consistent, honest and sensitive information by parents has been very well documented in the neonatal literature (BLISS, 2009, Blunt, 2009, Hall and Brinchmann, 2009). However, the study by Brethauer and Carey suggests that there is still a gap in this area of care highlighting that significant anxiety and uncertainty can exist in many parents to the extent of them having a negative lived experience. The need for consistent information is therefore paramount. Midwives and nurses should recognise the effect on parents if this is not achieved (Petty, 2010).

- Other research confirms the need for clear information, adequate facilities and integration of family inclusion as strategies to assist parents at this emotionally charged and transitional period in their lives (Tran et al, 2009; Redshaw and Hamilton, 2012; Mundy, 2010).

In addition, based on the case of Tom, further improvements can be put forward; namely,

- The use and greater availability of TcB assessment to avoid repetitive heel pricks.
- Once the SBR / TcB was at a lower level, the use of fibreoptic methods of phototherapy to enable parental handling and allow periods off treatment so allowing breast feeding and 'normalisation' as soon as possible.
- Greater use of comfort measures such sucrose, breast milk and containment during heel lancing and other procedures.

CONCLUSION

This paper has explored several issues that can arise when caring for a baby with jaundice within a neonatal unit such as effects of separation, maternal experience, importance of assessment skills and using current guidance and evidence to inform management. Although the focus has been on jaundice, the psycho-social issues explored and analysed apply to most babies and families cared for within the environment of a neonatal unit. No case study should ever be complete without consideration of the parents within holistic care of the baby in line with family centred care. It is important to be aware of the impact of hospitalisation on the *whole* family unit to ensure better outcomes can be achieved for all and any potential negative impact minimised as much as possible.

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